CLAIMS

1. A full color surface discharge type plasma display device comprising

pairs of lines of display electrodes, each pair of lines of display electrodes being parallel to each other and constituting an electrode pair for surface discharge,

lines of address electrodes insulated from the display electrodes and running in a direction intersecting the lines of display electrodes,

three phosphor layers different from each other in luminescent color facing the display electrodes and arranged in a successive order of the three phosphor layers along the extending lines of the display electrodes, and

a discharge gas in a space between said display electrodes and said phosphor layers,

wherein the adjacent three phosphor layers of said three different luminescent colors in a pair of lines of display electrodes define one image element of a full color display.

2. A device according to claim 1 wherein said image element has an area of almost a square and each of said three phosphor layers has a rectangular shape that is obtained by dividing said square of the image element and is long in a direction perpendicular to said lines of display electrodes.

3. A device according to claim 1 wherein each of the lines of said display electrodes comprises a combination of a transparent conductor line and a metal line in contact with the transparent conductor line and having a width narrower than that of the transparent conductor line and is disposed on the side of a viewer compared with the phosphor layers.

4. A device according to claim 3 wherein said transparent conductor lines have partial cutouts in

such a shape that the surface discharge is localized to a portion bewteen the display electrodes without the cutout in each unit luminescent area.

5. A device according to claim 1 wherein the total width of a pair of the display electrodes and a gap for discharge formed between said pair of the the display electrodes is less than 70 % of a pitch of said pairs of display electrodes.

6. A device according to claim 1 further comprising barriers standing on a substrate and dividing and separating said space between said display electrodes and said phosphor layers into cells corresponding to respective phosphor layers.

7. A device according to claim 6 wherein said barriers have side walls and said phosphor layers extend to and almost entirely cover the side walls of said barriers.

8. A device according to claim 7 wherein said address electrodes exist on a side of the substrate opposite to said display electrodes and said address electrodes are entirely covered with said phosphor layers.

9. A device according to claim 7 further comprising a substate and a underlying layer of a low melting point glass containing a light color colorant formed on said substrate and said address electrodes are formed on said underlying layer.

10. A device according to claim 7 wherein at least part of said barriers comprises a low melting point glass containing a light color colorant.

11. A device according to claim 7 wherein said barriers comprises a low melting point glass containing a dark color colorant in a top portion thereof and a low melting point glass admixed with a light color colorant in the other portion thereof.

12. A full color surface discharge plasma display device comprising

rst and second substrates facing and parallel to each other for defining a space in which a discharge gas is filled,

pairs of lines of display electrodes formed on the first substrate facing the second substate, each pair of lines of display electrodes being parallel to each other and constituting an electrode pair for surface discharge,

a dielectric layer over the display electrodes and the first substarate,

lines of address electrodes formed on the second substate facing the first substrate and running in a direction intersecting the lines of display electrodes,

three phosphor layers different from each other in luminescent color formed on the second substrate in a successive order of said three luminescent colors along the extending lines of the display electrodes, the phosphor layers entirely covering the address electrodes, and

barriers standing on the second substrate to divide and separate said discharge space into cells corresponding to respective phosphor layers, the barriers having side walls,

wherein the adjacent three phosphor layers of said three different luminescent colors in a pair of lines of display electrodes define one image element of a full color display and said phosphor layers extend to the side walls of said barriers to cover almost the entire surfaces of the side walls of said barriers.

13. A device according to claim 12 further comprising a erase address type drive control system by which once all of the image elements corresponding to the display electrodes are written, an erase pulse is applied to one of the pair of the display electrodes and simultaneously an electric field control pulse for neutralizing the applied erase pulse is selectively

applied to address electrodes.

14. A device according to claim 12 further comprising a write address type drive control system by which in displaying a line corresponding to a pair of the display electrodes, a discharge display pulse is applied to one of the pair of the display electrodes and simultaneously an electric field control pulse for writing is selectively applied to the address electrodes.

15. A device according to claim 14 wherein said write address type drive control system is constituted such that in displaying a line corresponding to a pair of the display electrodes, once all of the image elements corresponding to the display electrodes are subject to writing and erasing discharges, to store positive electric charges above said phosphor layers and negative electric charges above said dielectric layer, an electric discharge display pulse is applied to one of the pair of the display electrodes to make said one of the pair of the display electrodes negative in electric potential to the other of the pair of the display electrodes, and an electric discharge pulse is selectively applied to the address electrodes to make the address electrodes positive in electric potential to said one of the pair of the display electrodes.

16. A device according to claim 12 wherein each of the lines of said display electrodes comprises a combination of a transparent conductor line and a metal line in contact with said transparent conductor line and having a width narrower than that of the transparent conductor line and is disposed on the side of a viewer compared to the phosphor layers.

17. A device according to claim 12 wherein said barriers extend from and are fixed only to said second substrate.

18. A device according to claim 12 wherein each of said barriers is formed by a first barrier portion

formed on one of the substrates and a second barrier portion formed on the other of the substrates.

19. A device according to claim 17 wherein said barriers have a difference in height within 10 μm.

20. A device according to claim 19 wherein said barriers have a flat top surface.

21. A full color surface discharge plasma display device comprising

first and second substrates facing and parallel to each other for defining a space in which a discharge gas is filled, the first substrate being disposed on a side of a viewer,

pairs of lines of display electrodes formed on the first substrate facing the second substate, each pair of lines of display electrodes being parallel to each other and costituting an electrode pair for surface discharge, each of the display electrodes comprising a combination of a transparent conductor line and a metal line in contact with said transparent conductor line and having a width narrower than that of the transparent conductor line,

a dielectric layer over the display electrodes and the first substarate,

lines of address electrodes formed on the second substate facing the first substrate and running in a direction intersecting the lines of display electrodes,

barriers standing on the second substrate inparallel to said address electrodes for dividing said discharge gas space into cells, the barriers having side walls, and

three phosphor layers different from each other in luminescent color formed on the second substrate in a successive order of said three luminescent colors along the extending lines of the display electrodes, the phosphor layers entirely covering the address electrodes and extending to the

side walls said barriers to cover almost entire surfaces of the side walls of said barriers,

wherein the adjacent three phosphor layers of said three different luminescent colors in a pair of lines of display electrodes define one image element of a full color display.

22. A device according to claim 21 wherein the total width of said display electrodes and a gap for discharge formed therebetween is less than 70 % of a pitch of said pairs of display electrodes.

23. A device according to claim 21 wherein said barriers comprise a top portion of a low melting point glass cantaining a dark color colorant and the other portion of a low melting point glass cantaining a light color colorant.

24. A process for manufacturing a full color surface discharge plasma display device as set forth in claim 12, in which said address electrodes and said barriers are parallel to each other and said address electrodes comprise a main portion for display parallel to said barriers and a portion at an end of said main portion for connecting outer leads, said process comprising the steps of:

printing a material for forming said main portions of the address electrodes using a printing mask,

printing a material for forming said outer lead-connecting portions, and

printing a material for forming said barriers using said printing mask used for printing said material for forming the main portions of the address electrodes.

25. A process for manufacturing a full color surface discharge type plasma display device as set forth in claim 12, said process comprising the steps of:

forming said barriers on said second substrate,

ost filling gaps between said barriers above said second substrate with a phosphor paste,

firing said phosphor paste to reduce the volume of said phosphor paste and form recesses between said barriers and to form a phosphor layer covering almost the entire surfaces of side walls of said barriers and covering surfaces of said second substrate between said barriers.

26. A process according to claim 25 wherein said phosphor paste comprises a phosphor in an amount of 10 to 50 % by weight.

27. A process according to claim 25 wherein said filling of said phosphor paste is performed by screen printing said phosphor paste into said gaps with a square squeezer at a set angle of 70 to 85 degrees.

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